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(54) Title: PREPARATION OF POUR-IN-PLACE ARTICLES EMPLOYING ELASTOMER COATING

(57) Abstract

A process for preparing a material covered, pour-in-place article is disclosed, comprising the steps of: (a) applying a polymeric coating, which is prepared by reacting a polyisocyanate and an isocyanate reactive material at an isocyanate index in the range of 30 to 1500, to one side of a material covering before or after placing the material covering in a mold; (b) pouring a liquid foamable composition onto the coated side of the material; (c) foaming the liquid foamable composition; and (d) removing the resulting foamed, laminated, material covered article from the mold. Articles prepared with the process are also disclosed.

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PREPARATION OF POUR-IN-PLACE ARTICLES EMPLOYING ELASTOMER COATING

Field of the Invention

This invention relates to the preparation of pour-in-place articles. More particularly, this invention relates to the employment of coatings in the preparation of pour-in-place, material covered articles.

Background of the Invention

Pour-in-place articles are generally prepared by placing a material covering, such as a piece of vinyl or fabric, into a mold and then pouring a liquid foam forming reaction mixture, such as a polyurethane composition, into the mold. A vacuum is often used to insure that the material covering snugly fits the contour of the mold. For example, U.S. Patent No. 4,806,088 discloses an apparatus for preparing textile covered cushions in which a fabric cover is adapted to the contour of a mold cavity by the application of a vacuum and then a foam forming reaction mixture is introduced into the mold. U.S. Patent Nos. 4,046,611 and 4,637,789 also disclose the preparation of cushions by vacuum molding.

After the foam forming reaction mixture is poured into the mold and the foam cures, the foam and the material covering are firmly adhered to one another thereby producing a material covered molded article. However, one problem encountered with this procedure is that the liquid foamable composition has a tendency to seep through the interstices of the material covering to the outer surface of the material causing disruption and discoloration of the material's exterior surface. This phenomenon is known as

"strike-through." The problem of strike-through is made much worse by the application of a vacuum.

To prevent strike-through, a variety of methods have been employed. For example, in U.S. Patent No. 3,932,252, a strippable coating is sprayed onto one side of a fabric, the fabric is placed in a mold cavity so that the coating will be between the fabric and the mold, a vacuum is applied to the fabric, a foamable compound is placed into the mold, the compound is foamed, and then the strippable coating is removed from the molded article.

The most common method, however, of preventing strike-through is to adhere a film or sheet to the back side of the covering. For example, U.S. Patent No. 4,610,923 discloses a process for preparing laminated fabric structures in which a flexible elastomeric skin containing microspheres is adhered to a stretchable fabric, the laminate is placed into a vacuum mold, and a liquid foamable composition is added to the mold and foamed.

While solving the problem of strike-through, the use of such films and sheets generates other problems. One problem is that the film must be adhered to the material covering in order for there to be sufficient adhesion between the covering, the film and the foam substrate of the upholstered article. The film or sheet is usually adhered to the covering by using an adhesive or by flame bonding. Attaining the appropriate adhesion adds a step to the preparation of material covered articles thereby increasing the cost and time of production. Another problem is that many of the thermoplastic films employed and/or the methods used to adhere the film to the covering give the

covering a boardy and uncomfortable feel, i.e. a "poor hand".

Another way to avoid strike-through is to first prepare a foam body and then adhere the material covering to the foam body. For example, U.S. Patent No. 4,975,135 discloses a process for preparing a vehicle seat in which a composite insert is prepared by laminating a porous fabric to a polymeric foam sheet, placing the composite into a vacuum mold, and adhering a foam bun to the composite insert. This method, however, is not as convenient as preparing the foamed body in the mold by the pour-in-place method and adds an additional step to the preparation of material covered articles, namely the step of adhering the material to an already formed foam body.

In U.S. Patent No. 4,740,417, a process is disclosed for preparing an article wherein a flexible polyurethane foam is laminated to the backside of a fabric, the laminated fabric is placed in a vacuum mold, and a thermoplastic substrate is heated until it sags and flows into the mold.

Accordingly, there is a need for a process for preparing an article covered by a material which avoids the step of adhering an already formed film or sheet to a material covering and the step of adhering a material covering to an already formed foam body. There is a further need for an efficient and economical process for preparing material covered foamed articles. There is also a need for a process for producing pour-in-place molded articles which eliminates strike-through while providing a material cover with a good hand.

It is therefore an object of this invention to provide an efficient and economical method of preparing material covered articles.

It is another object to provide a means of preparing vacuum molded articles that have a material covering which is not stiff or boardy.

It is yet another object to provide a process for preparing material covered molded articles that eliminates strike-through.

It is a further object to provide material covered articles that have excellent properties.

These and other objects are obtained by the process of this invention.

Summary of Invention

The invention is a process for preparing material covered, pour-in-place articles comprising the steps of:

(a) applying a polymeric coating, which is prepared by reacting a polyisocyanate and an isocyanate reactive material at an isocyanate index in the range of 30 to 1500, to one side of a material covering before or after placing the material covering in a mold;

(b) pouring a liquid foamable composition onto the coated side of the material;

(c) foaming the liquid foamable composition; and

(d) removing the resulting foamed, laminated, material covered article from the mold.

In a preferred embodiment, a textile fabric is used as the material covering and the process comprises the steps of:

(a) applying a polymeric coating, which is prepared by reacting a polyisocyanate and an

isocyanate reactive material at an isocyanate index in the range of 30 to 100, to one side of a textile fabric covering before or after placing the covering in a vacuum mold;

(b) pouring a liquid foamable composition onto the coated side of the textile fabric covering in the mold;

(c) foaming the liquid foamable composition; and

(d) removing the resulting foamed, laminated, fabric article from the mold.

The present invention further comprises a process for preparing an upholstered, vacuum molded pour-in-place article, comprising the steps of:

(a) applying a polymeric coating, which is prepared by reacting a polyisocyanate and a polyol at an isocyanate index in the range of 30 to 1500, to one side of a textile fabric covering before or after placing the covering in a mold;

(b) vacuum forming the textile fabric covering in the mold;

(c) pouring a liquid foamable composition onto the coated side of the textile fabric covering in the mold;

(d) foaming the liquid foamable composition; and

(e) removing the resulting foamed, laminated, fabric article from the mold.

The material covered, pour-in-place, article produced by the present process is comprised of:

(a) a material covering;

(b) a polymeric coating, prepared by reacting a polyisocyanate and an isocyanate reactive material at an isocyanate index in the range of 30 to 1500, affixed to one side of the material covering; and

(c) a foam body adhered to the coating.

The process can be used to make a wide variety of upholstered articles. It is particularly useful for making upholstered seats for vehicles.

Detailed Description of the Invention

The articles prepared according to the process of this invention are foamed articles having a material covering. The material covering can be any material to which the polyurethane coating firmly adheres. Suitable materials include vinyl, leather, and textile fabric coverings. The preferred covering is a textile fabric covering. As used herein, the term "textile fabric covering" includes any porous fabric or cloth that can be employed as a covering. The textile fabric covering can be made from synthetic or natural fibers or a blend of synthetic and natural fibers.

The size and shape of the material covering of course depends upon the type of foamed article being prepared. The material covering is usually comprised of a single piece of material which has been cut to fit the contour of a mold. However, the material covering can be prepared from several pieces of material which are attached to each other, e.g. by sewing.

After the material covering is prepared so that it has the desired shape, the material covering is coated on one side with a polymeric coating. The coating can be applied either before or after the material covering is placed into a mold. If the coating is applied before the material covering is placed into the mold, the covering is placed into the mold so that the uncoated side is against the interior surface of the mold. Preferably, the material covering is vacuum formed after being placed into the

mold so that the material snugly fits the contour of the mold. If the material coating is placed into a vacuum mold before being coated, it is preferred to coat one side of the material covering before the covering is vacuum formed.

The polymeric coating applied to the material covering is preferably a polyurethane and/or polyurea coating (i.e. a polyurethane coating, a polyurea coating, or a coating having both polyurethane and polyurea linkages). More preferably, the coating is a polyurethane coating. The coating can be prepared at an isocyanate index in the range of 30 to 1500. However, an isocyanate index above 200 will generally only be used when a coating having isocyanurate linkages is used or when a moisture-cure system is used to prepare the coating. As used herein, "isocyanate index" is the ratio of isocyanate (-NCO) equivalents to the total number of equivalents of isocyanate-reactive groups expressed as a percentage.

Preferably after curing, the polyurethane and/or polyurea coating is soft and flexible so that the material covering is not boardy or stiff, and the coating is strong enough so that if it is stretched by a vacuum, it remains intact. In order to achieve these properties, the polyurethane and/or polyurea coating is preferably prepared at an isocyanate index in the range of 30 to 100, more preferably in the range of 40 to 80, still more preferably in the range of 45 to 60, and most preferably in the range of 45 to 55. Although it is possible to use an isocyanate index below 30, the resulting coating will be tacky and will not completely cure. As a result, the coated material covering will be difficult to handle and to process. On the other hand, if the isocyanate index

exceeds about 100, the covering may be stiff and boardy once the coating cures.

The organic polyisocyanates which may be used in the preparation of the polyurethane coating include any of the aliphatic, cycloaliphatic, araliphatic or aromatic polyisocyanates known in polyurethane or polyurea chemistry, especially those that are liquid at room temperature. Examples of suitable polyisocyanates include ethylene diisocyanate, 1,6-hexamethylene diisocyanate, isophorone diisocyanate, cyclohexane 1,4-diisocyanate, 4,4'-dicyclohexylmethane diisocyanate, 1,4-xylylene diisocyanate, 1,4-phenylene diisocyanate, 2,4-toluene diisocyanate, 2,6-toluene diisocyanate, 4,4'-diphenylmethane diisocyanate (4,4'-MDI), 2,4'-diphenylmethane diisocyanate (2,4'-MDI), polymethylene polyphenylene polyisocyanates (crude MDI) and 1,5-naphthylene diisocyanate. Mixtures of polyisocyanates can be used and also polyisocyanates which have been modified by the introduction of urethane, allophanate, urea, biuret, carbodiimide, uretonimine or isocyanurate residues.

In general, the aromatic polyisocyanates are preferred. The most preferred aromatic polyisocyanates are 4,4'-diphenylmethane diisocyanate, 2,4'-diphenylmethane diisocyanate, polymeric MDI, MDI variants, and mixtures thereof. Suitable MDI variants include compounds in which the MDI has been modified by the introduction of urethane, allophanate, urea, biuret, amide, carbodiimide, uretonimine or isocyanurate residues.

Isocyanate-terminated prepolymers may also be employed and are prepared by reacting an excess of polyisocyanate with polyols, including aminated polyols, imine or enamine polymers, or polyamines. A

particularly preferred isocyanate terminated prepolymer is the reaction product of a polymeric MDI and a polyether polyol. Pseudo-prepolymers may also be employed. A pseudo-prepolymer is a mixture of a prepolymer and one or more monomeric di- or poly-isocyanates. Examples of suitable materials include Rubiflex 26A available from ICI Americas.

The isocyanate reactive resins that are useful in the preparation of the polyurethane and/or polyurea coatings include polymeric polyols, amines, imino-functional and enamino-functional compounds having molecular weights in the range of 1500 to 12,000. Preferably, the isocyanate reactive material is a polyol.

Suitable polyols that may be used to prepare polyurethane coatings include those selected from the group consisting of polythioether, polyester, polyester amide, polycarbonate, polyacetal, polyolefin, polysiloxane and polyether polyols. Polyether polyols are preferred.

Suitable polyether polyols include products obtained by the polymerization of a cyclic oxide, for example ethylene oxide, propylene oxide or tetrahydrofuran in the presence, where necessary, of polyfunctional initiators. Suitable initiator compounds contain a plurality of active hydrogen atoms and include water, polyols, for example ethylene glycol, propylene glycol, diethylene glycol, resorcinol, bisphenol A, glycerol, trimethylolpropane, 1,2,6-hexanetriol, triethanolamine, pentaerythritol, sorbitol or sucrose, ammonia, primary monoamines, for example aniline or benzylamine, polyamines, for example ethylene diamine, hexamethylene diamine, toluene diamines, diaminodiphenylmethanes and

polymethylene polyphenylene polyamines obtained by the condensation of aniline and formaldehyde, and amino alcohols, for example ethanolamine and diethanolamine. Mixtures of initiators and/or cyclic oxides may be used.

Especially useful polyether polyols include polyoxypropylene, polyoxyethylene, and poly(oxyethylene-oxypropylene) diols and triols, which are obtained by the simultaneous or sequential addition of ethylene and propylene oxides to appropriate di- or tri-functional initiators as fully described in the prior art. Mixtures of the diols and triols are also useful. The most preferred polyether polyols are polyoxyethylene capped polyoxypropylene diols and triols.

Polyester polyols which may be used include hydroxyl terminated reaction products of polyhydric alcohols such as ethylene glycol, propylene glycol, diethylene glycol, 1,4-butanediol, bis(hydroxyethyl) terephthalate, glycerol, trimethylolpropane or pentaerythritol or mixtures thereof with polycarboxylic acids, especially dicarboxylic acids or their ester-forming derivatives, for example, succinic, glutaric and adipic acids or their dimethyl esters, sebacic acid, phthalic anhydride, tetrachlorophthalic anhydride or dimethyl terephthalate. Polyesters obtained by the polymerization of lactones, for example caprolactone, in conjunction with a polyol, may also be used. Polyesteramides may be obtained by the inclusion of aminoalcohols such as ethanolamine in polyesterification mixtures.

Polythioether polyols which may be used include products obtained by condensing thiodiglycol either

alone or with other glycols, dicarboxylic acids, formaldehyde, aminoalcohols or aminocarboxylic acids.

Polycarbonate polyols which may be used include products obtained by reacting diols such as 1,3-propanediol, 1,4-butanediol, 1,6-hexanediol, diethylene glycol or tetraethylene glycol with diaryl carbonates, for example diphenyl carbonate or with phosgene.

Polyacetal polyols which may be used include those prepared by reacting glycols such as diethylene glycol, triethylene glycol or hexanediol with formaldehyde. Suitable polyacetals may also be prepared by polymerizing cyclic acetals.

Suitable polyolefin polyols include hydroxy-terminated butadiene homo- and copolymers, and suitable polysiloxane polyols include polydimethylsiloxane diols and triols.

Examples of suitable polyols for use in the present invention include FFS-2805 available from ICI Americas.

The types of amino functional compounds suitable for the preparation of a polyurea coating are well known to those skilled in the art. Suitable imino-functional and enamino-functional compounds for preparing polyurea coatings are disclosed in U.S. Patent Nos. 4,749,129, 4,866,103, and 4,910,279, which are incorporated herein by reference. Preferably, the amino-, imino- and enamino-functional compounds are compounds in which all or part of the OH groups on a polyol have been replaced by the respective functional groups.

In preparing the polyurethane and/or polyurea coatings, one or more polyisocyanates are reacted with one or more isocyanate reactive materials at an

isocyanate index in the ranges given above under substantially anhydrous conditions at a temperature in the range of room temperature to 180°C. Chain extenders and cross-linkers, such as amines, glycols, imines and enamines, may be included in the reaction mixture. Generally, the chain extenders and cross-linkers will have molecular weights below about 1500. In addition, the polyisocyanates and isocyanate reactive materials can optionally be reacted in the presence of catalysts known in the art, such as dibutyltin dilaurate and tertiary amines such as triethylene diamine. Suitable catalysts are disclosed in U.S. Patent No. 4,794,129, which was previously incorporated by reference. Optionally, a molecular sieve can be included in the reaction mixture to serve as a water scavenger so that any water that is present will not blow and cause the coating to foam. Suitable catalysts and molecular sieves for use in a specific formulation will be evident to one skilled in the art from the present disclosure.

The polyisocyanate and the isocyanate reactive material (as well as any catalysts, chain extenders, and other ingredients) are usually mixed just prior to applying the coating to one side of the material covering. The isocyanate reactive material and the polyisocyanate can be mixed and applied to the material covering by any suitable means. For example, they can be mixed with a drill mixer and applied by hand, such as with a spatula or knife. However, it is preferred that the isocyanate reactive material and the polyisocyanate be applied by spraying. Most preferably, the isocyanate reactive material and the polyisocyanate are impingement mixed in a spraying apparatus, and the coating is sprayed onto the fabric.

Any conventional sprayer for spraying polyurethane and polyurea materials known to those skilled in the art may be employed.

Preferably, the spraying device has a compartment in which the polyisocyanate can be stored and a compartment in which the isocyanate reactive material (as well as chain extenders and other ingredients) can be stored. Such a sprayer should have a means to pump the polyisocyanate and the isocyanate reactive material from the compartments into a sprayhead. Generally, the polyisocyanate and the isocyanate reactive compounds are impingement mixed in the nozzle of the sprayer. A suitable spraying apparatus is a Graco Hydra Cat sprayer and pump unit, which is available from Graco, equipped with a Gusmer GX7 sprayhead, which is available from Gusmer. Prior to being mixed, the polyisocyanate and the isocyanate reactive material are maintained in their respective compartments at a temperature in the range of 18°C to about 50°C. The polyisocyanate and the isocyanate reactive material are usually metered together at a pressure in the range of 600 to 2000 psi, and the pressure on each component is usually the same.

It is, of course, possible to react the isocyanate and the isocyanate reactive material before applying the coating as long as the resulting prepolymer can be readily applied to the material covering

The coating is usually applied at a thickness of about 0.05 millimeters up to about five millimeters to one side of the material covering. The coating is allowed to cure for several seconds to several minutes (generally not more than about two minutes) before the coated covering is placed into a mold. The length of

cure time varies with the type of formulation used to prepare the coating.

Either before or after being coated, the covering is placed into a mold. The shape of the mold will of course depend upon the type of article that is desired. After the covering is placed into the mold, it is preferred to pull a vacuum so that the material covering snugly fits the contour of the mold.

The types of vacuum molds suitable for use are well known to those skilled in the art. Suitable vacuum molds are described in U.S. Patent Nos. 4,046,611, 4,637,789, 4,740,260, 4,860,415 and 4,975,135, all of which are incorporated herein by reference.

After the coated material covering is in the mold, a liquid foamable composition is poured onto the coated side of the covering and foamed. The type of liquid foamable composition is not critical, and virtually any type of composition which can be poured into a mold and foamed and which will adhere to the polyurethane and/or polyurea coating can be employed. Neither is the type of foam produced from the liquid foamable composition critical. Both flexible and rigid foams may be used, depending upon the end use of the product which is produced. The type of product being prepared will determine the type of liquid foamable composition that is needed as well as the nature of the resulting foam (i.e. flexible or rigid) that is needed. The preferred liquid foamable compositions are polyurethane, polyurea and/or polyisocyanurate liquid foamable compositions.

The preparation of polyurethane, polyurea and/or polyisocyanurate foams is well known. When the foam body is a polyurethane foam, the liquid foamable

reaction system from which the polyurethane foam is prepared is comprised of one or more polyisocyanates, one or more polyols, and a blowing agent. When the liquid foamable composition is a polyurea liquid foamable composition, it will be comprised of one or more polyisocyanates, one or more amino, imino or enamino functional compounds, and a blowing agent. When the composition is a polyisocyanurate, it will be prepared at an isocyanate index exceeding about 200 and with a catalyst suitable for the isocyanurate reaction. Such catalysts and the preparation of polyisocyanurate foams are well known in the art.

Suitable components useful to form specific foams in a particular application will be evident to those skilled in the art from the present specification. A presently preferred foam is that formed by the reaction of Rubiflex 26A isocyanate prepolymer and FFS-3066B polyol, both available from ICI Americas.

The polyisocyanates listed above which are suitable for preparing the polymeric coating may be used to prepare the liquid foamable composition. All the isocyanate reactive resins listed above as being suitable for preparing the coating may be used to prepare a liquid foamable composition. Suitable blowing agents include water, dissolved or dispersed gases, such as air, carbon dioxide, nitrogen oxides and nitrogen, and low boiling halogenated hydrocarbons, such as methylene chloride and trichloromonofluoromethane. The amount of blowing agent used is preferably less than about four percent by weight of the total reactants.

When a liquid foamable composition is used, any of the conventional chain extenders and additives, such as surfactants, foam stabilizers, fire retardants

and fillers, known in the art may also be employed. Suitable examples of such chain extenders and additives are described in U.S. Patent No. 4,935,460, which is incorporated herein by reference.

Since the coating on the material covering is preferably prepared at an isocyanate index in the range of 30 to 100, there may be unreacted sites in the coating which can react with the liquid foamable composition. As a result, the coating and the foam body produced from the liquid foamable composition will, in most cases, be strongly bonded to one another.

The process of this invention can be used to prepare a wide variety of upholstered articles. The process finds particular application in the automotive industry where it can be used to prepare interior trim parts of vehicles, such as door panels and package trays, head rests and seats. The most preferred application of the process is to prepare pour-in-place upholstered vehicle seats. The vacuum molds disclosed in U.S. Patent Nos. 4,740,260, 4,860,415, and 4,975,135 can be used to prepare such seats. The articles prepared by the process of this invention can have material coverings which are soft and flexible, have a good hand, and are not marred by strike-through.

The invention is illustrated with reference to the following non-limiting examples.

EXAMPLES

In each of the following examples, all parts are by weight unless specified.

Example 1

A 38 centimeter by 38 centimeter piece of automotive fabric was placed flat on a table. The polyurethane coating was prepared by mixing 5.4 parts of Rubiflex 26A, which is available from ICI Americas Inc. and which is an MDI prepolymer having a free isocyanate content of 25.3 to 26.5 percent and prepared by reacting a mixture of 2,4'-MDI and 4,4'-MDI with a polyoxypropylene polyol and then with a poly(oxyethylene-oxypropylene) triol, 100 parts of FFS-2805, which is an ethylene oxide diol and which is available from ICI Americas Inc., 2 parts of Uniseive Paste, which is a solid molecular sieve available from UOP of Des Plaines, Illinois, and 1 part of Dabco 33LV, a triethylene diamine in glycol catalyst available from Air Products, Inc. The Uniseive Paste served as a water scavenger and prevented the coating from foaming. The isocyanate index of the coating was 50.

The ingredients were mixed in a vessel with a drill mixer at 1500 RPM for 30 seconds. The reaction mixture was then poured from the vessel directly onto the exposed side of the fabric and spread evenly with a spatula to form a coating having a thickness of 2 to 5 millimeters. After the coating cured, the coated fabric was placed into a vacuum mold so that the uncoated side was in contact with the interior surface of the mold. A vacuum was applied to draw the fabric to the shape of the mold.

A polyurethane liquid foamable composition was then prepared by mixing Rubiflex 26A (the "A component") and FFS-3066B (the "B component"), both available from ICI Americas Inc., in a ratio of 0.589 (Rubiflex 26A to FFS-3066B). The components were mixed in a high impingement pouring machine. The composition was then poured onto the coating on the fabric, foamed and allowed to cure. The fabric on the resultant article had a soft feel and there was no strike-through of the foam.

Example 2

Example 1 was repeated except that the ingredients for the coating were placed into a high pressure sprayer and were impingement mixed as they were fed into the spray nozzle and the polyurethane coating was sprayed onto the fabric at a thickness of about 2 to 3 millimeters. The fabric on the resulting article had a soft feel, and there was no strike-through of the foam.

Example 3

Example 1 was repeated except that the amounts of Rubiflex 26A and FFS-2805 were adjusted so that the isocyanate index of the coating was 25. Although the resulting article had a fabric covering with a good hand, the polyurethane coating was quite tacky thereby making it difficult to handle the fabric when the fabric was placed into the vacuum mold.

Example 4

Example 1 was repeated except that the amounts of Rubiflex 26A and FFS-2805 were adjusted so that the isocyanate index of the coating was 105. The

resulting article had a fabric covering which was stiff and boardy.

The examples illustrate that upholstered fabric covered articles without strike-through and with a good hand can be prepared by the pour-in-place method. The examples further illustrate that vacuum formed articles with good exterior properties can be prepared without the step of adhering a preformed film or sheet to the material covering to prevent strike-through. It can also be seen from the examples that when the isocyanate index is too low, the polyurethane coating is too tacky to be easily handled, and that when the isocyanate index is too high, the material covering may be stiff and boardy.

Example 5

Example 1 was repeated, except that the following foamable composition was used. The foam formulation comprised 100 parts of F2805; 80.5 parts of Rubiflex 26A; 1.0 part of X-8162; 1.0 part of SPF; 2.0 parts of Unilink 4200; and 4.0 parts of water. F2805 is a polyol available from ICI Americas; X-8162 is an amine catalyst available from Air Products Inc.; SPF is an amine catalyst available from Toyo Soda; and Unilink 4200 is a chain extender available from UOP.

The foam formulation was mixed using a drill press and a mixing blade. The fabric was then coated with the formulation and the fabric was then placed into a vacuum mold so that the uncoated side of the fabric was in contact with the interior surface of the mold. A vacuum was applied to draw the fabric to the shape of the mold. The foam formulation was then poured directly onto the fabric and was allowed to cure.

The foamed article had a soft feel and there was no strike-through of the foam.

The present invention may be embodied in other specific forms without departing from the spirit or essential attributes thereof and, accordingly, reference should be made to the appended claims rather than to the foregoing specification as indicating the scope of the invention.

CLAIMS

What is claimed is:

1. A process for preparing a material covered, pour-in-place article comprising the steps of:

(a) applying a polymeric coating, which is prepared by reacting a polyisocyanate and an isocyanate reactive material at an isocyanate index in the range of 30 to 1500, to one side of a material covering before or after placing the material covering in a mold;

(b) pouring a liquid foamable composition onto the coated side of the material;

(c) foaming the liquid foamable composition; and

(d) removing the resulting article from the mold.

2. A process for preparing an upholstered, vacuum molded, pour-in-place article comprising the steps of:

(a) applying a polymeric coating, which is prepared by reacting a polyisocyanate and an isocyanate reactive material at an isocyanate index in the range of 30 to 1500, to one side of a textile fabric covering before or after placing the covering in a mold;

(b) vacuum forming the textile fabric covering in a mold;

(c) pouring a liquid foamable composition onto the coated side of the textile fabric covering in the mold;

(d) foaming the liquid foamable composition; and

(e) removing the resulting article from the mold.

3. A process as in claim 1 or 2, wherein said polymeric coating is a polyurethane coating.

4. A process as in claim 1 or 2 wherein said isocyanate reactive material is a polyol.

5. A process as in claim 1 or 2, wherein the isocyanate index is in the range of from 30 to 100.

6. A process as in claim 1 or 2, wherein the polyisocyanate is an aromatic polyisocyanate.

7. A process as in claim 6 wherein the polyisocyanate is selected from the group consisting of 4,4'diphenylmethane diisocyanate, 2,4'diphenylmethane diisocyanate, polymeric MDI, MDI variants and mixtures thereof.

8. A process as in claim 1 or 2 wherein the liquid foamable composition is selected from the group consisting of a polyurethane, polyurea and a polyisocyanurate liquid foamable composition.

9. A material covered, pour-in-place article prepared by the process of claim 1.

10. An upholstered, vacuum molded, pour-in-place article prepared by the process of claim 2.

A. CLASSIFICATION OF SUBJECT MATTER
IPC 5 B29C67/22

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 5 B29C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	EP,A,0 259 810 (INOUE MTP KK) 16 March 1988 see page 3, line 22 - line 23 see page 4, line 19 - line 21 see page 4, line 29 - line 34 see page 5, line 5 - line 28 see page 5, line 52 - line 55 see page 8, line 50 - page 9, line 9; figures 3-5	1-4,6-10
Y	FR,A,2 151 651 (ETABLISSEMENTS ALTRAMOUSS) 20 April 1973	1-4,6-10
A	FR,A,2 216 142 (STOREY BROTHERS AND COMPANY LIMITED) 30 August 1974 see page 1, line 1 - line 4; claims 1,6,8-11	1-3,8-10

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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

* Special categories of cited documents :

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"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
23 June 1994	0 8. 07. 94

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Inte ɔnal Application No
PCT/GB 94/00776

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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